A sibling species of *Gibberula cordorae* (de Jong and Coomans, 1988) in the Leeward Antilles

Una especie gemela de *Gibberula cordorae* (de Jong and Coomans, 1988) en las Antillas de Sotavento

Franck BOYER*

Recibido el 13-XI-2002. Aceptado el 14-II-2003

ABSTRACT

The species *Gibberula cordorae* (de Jong and Coomans, 1988) is revised. Its distribution ranges from the type locality of Curaçao up to Saint-Vincent and Saint-Lucia. The morphologic variability of its shell is observed as being very low in Saint-Vincent and noticeably higher in Curaçao.

A sibling species, *Gibberula colombiana* sp. nov., is described from Martinique. Its distribution ranges up to eastern Guadeloupe. The morphologic variability of its shell is low, and shows more affinities with the population from Curaçao than with the Saint-Vincent's one.

The present distribution of these different populations is interpreted as resulting from distinct dispersion stages rather than from a continuous geographic cline.

RESUMEN

Se revisa la especie *Gibberula cordorae* (de Jong and Coomans, 1988). Su área de distribución incluye desde la localidad típica de Curaçao hasta Saint-Vincent y Saint-Lucia. La variabilidad morfológica de su concha ha sido observada siendo muy baja en Saint-Vincent y evidentemente alta en Curaçao.

Una especie gemela, *Gibberula colombiana* sp. nov., es descrita de Martinique. Su área de distribución llega hasta el este de Guadaloupe. La variabilidad morfológica de su concha es baja, y muestra más afinidad con la población de Curaçao que con la de Saint-Vincent.

La presente distribución de estas differentes poblaciones es interpretada como el resultado de distintos estados de dispersión más que como procedente de una variación clinal.

KEY WORDS: *Gibberula,* Lesser Antilles, sibling species, geographic dispersion, allopatric speciation, variability.
PALABRAS CLAVE: *Gibberula,* Antillas menores, especies gemelas, dispersión geografica, especiación alopátrica, variabilidad.

INTRODUCTION

The species *Gibberula cordorae* (de Jong and Coomans, 1988) was not recorded in the literature since its description on 19 shells collected at 30 m depth off Curaçao. Except for few additional material sampled in Curaçao by R. Moolenbeek (Zoologisch Museum Amsterdam) in the beginning of the

* 110, Chemin du Marais du Souci, 93270 Sevran, France.

heighties, the species remained perfectly elusive for many years in public and private collections.

During the second half part of the nineties, some few additional samples have been yielded from Curaçao by dutch collectors, and similar morphs have been discovered from Saint-Vincent to Guadeloupé by french collectors.

On the ground of these last findings, J. Colomb (pers. comm.) observed the constant occurrence of a brown patch on the columella of the shells from Saint-Vincent and Saint-Lucia, and the absence of such a patch on the shells from Martinique. By the fact of these divergent features and of contrasted ranges of length between both sets of shells, J. Colomb suggested that two allopatric species might be represented under the form *G. cordorae*, the population from Martinique constituting a sibling species new to the science.

Stimulated by such a suggestion, the revision of *G. cordorae* is conducted hereunder, and its variability is studied.The specific identity of the population ranging in Martinique is verified to be distinct and to deserve a description as a new species.

Gibberula cordorae was initially described as belonging to the genus *Persicula*. In fact, both genera are very close. They have the same kind of soft parts external anatomy with bifurcated dead, and their shells principally differ by the presence of a thick external labial margin bordered by a noticeable groove in the species attributed to *Persicula* (Boyer, Neefs and Wakefield, 1998).

Abbreviations

ad= adult, juv= juvenile, spm= live collected specimen, sh= dead collected shell, splg= sampling.
MNHN Muséum national d'Histoire naturelle, Paris.
ZMA Zoologisch Museum Amsterdam
FBC F. Boyer collection
JCC J. Colomb collection.

RESULTS

Family Cystiscidae Coovert and Coovert, 1995
Genus *Gibberula* Swainson, 1840

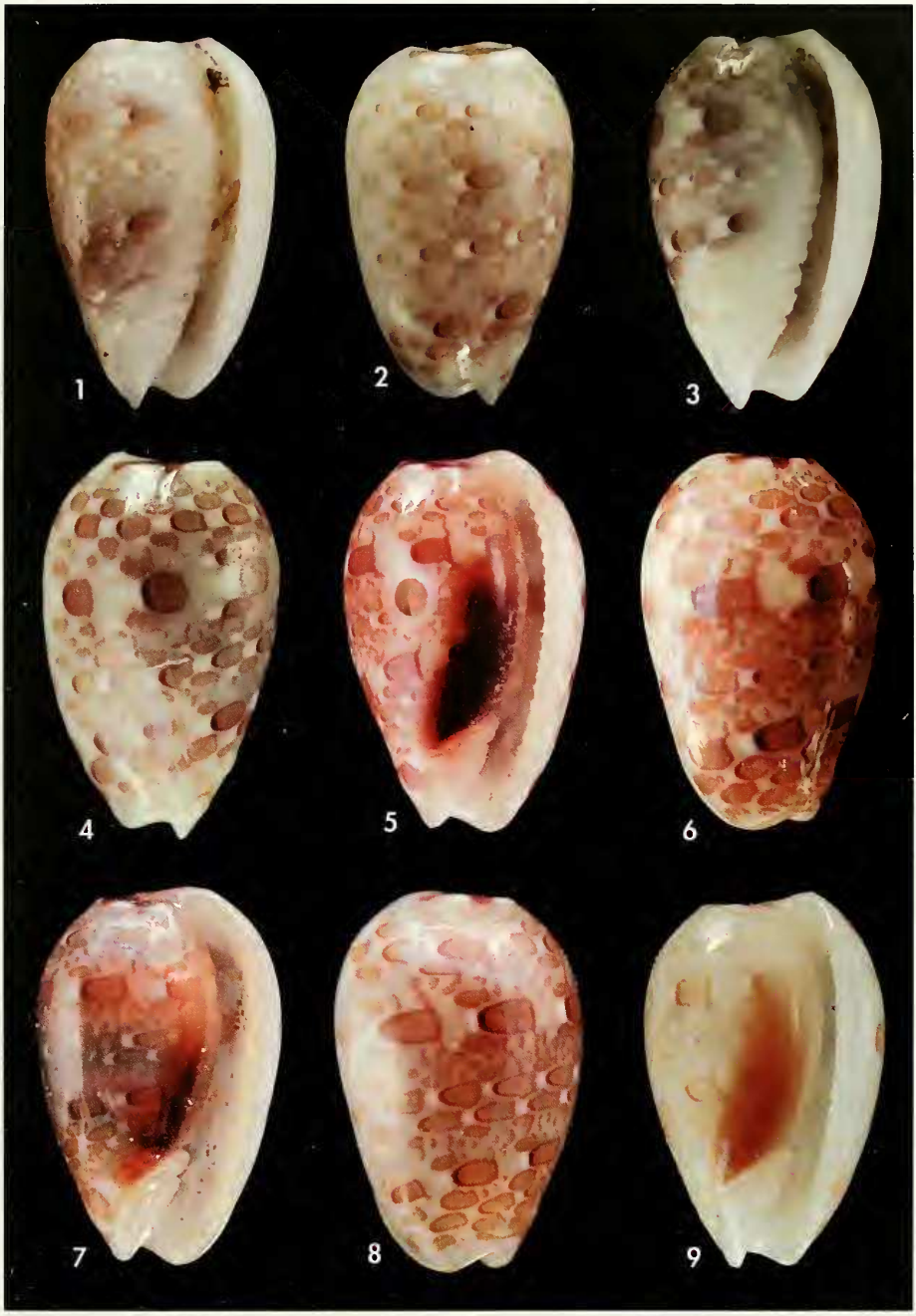
Type species: *Gibberula zonata* Swainson, 1840 by monotypy (=*Volvarina oryza* Lamark, 1822).

Gibberula cordorae (De Jong and Coomans, 1988) (Figs. 5-9, 10 A-C).

Persicula cordorae De Jong and Coomans, 1999, p. 99, pl. 41, figs. 543 A, B.

Type material: Holotype in ZMA (n° 3.87.093). Non studied.
Other material studied: 14 ad sh (L=5.05 to 6.10 mm), 27 juv and fragments, Saint Kruys Bay, Curaçao, 20-30 m, FBC, leg. J. Neefs (Breda, Netherland); 4 ad sh (L=5.70 to 6.30 mm),1 juv, Curaçao, 30-60 m, FBC; 1 ad spm (L=5 mm), 3 ad sh (L=5 to 5.30 mm), 3 juv, Curaçao, 6-10 m, FBC; 118 ad sh (L=3.85 to 5.15 mm),14 juv and fragments, Saint-Vincent, 30-40 m, J. Colomb splg 03-01, FBC; 21 ad sh (L=4.08 to 5.41 mm), Saint-Vincent, 30-40 m, J. Colomb splg 03-01, JCC (Figs. 5-8); 8 ad sh (L=4.51 to 5.22mm), Pigeon Island, Roadney Bay, Saint-Lucia, 2 m, J. Colomb splg 03-01, JCC (Fig. 9).
Type locality: Curaçao, Santa Martha, at a depth of 30 m.

Original description: "Shell small with a flat apex. Outer lip thickened and serrated on the inside. Last whorl smooth and shiny. The colour pattern consists of alternately 2 prominent and 3 much less prominent pattern-rows in spiral form. The 2 prominent rows each consist of 5 to 6 well separated figures. Each figure is built up of a large brown rectangle and next to this on both sides a much narrower brown rectangle. The figures in the three less prominent rows each



Figures 1-4. *Gibberula colombiana* sp. nov. 1, 2: holotype (MNHN), 6.0 x 3.8 mm; 3, 4: paratype 1 (CJC), 6.1 x 4.0 mm. Figures 5-9. *Gibberula cordorae* (De Jong and Coomans). 5, 6: Saint-Vincent, 40 m, 5.2 x 3.3 mm; 7, 8: Saint-Vincent, 40 m, 5.2 x 3.1mm; 9: Saint-Lucia, 10 m, 5.1 x 3.5 mm. *Figuras 1-4.* Gibberula colombiana *sp. nov. 1, 2: holotype (MNHN), 6,0 x 3,8 mm; 3, 4: paratype 1 (CJC), 6,1 x 4,0 mm. Figuras 5-9.* Gibberula cordorae *(De Jong and Coomans). 5, 6: Saint-Vincent, 40 m, 5,2 x 3,3 mm;7, 8: Saint-Vincent, 40 m, 5,2 x 3,1mm; 9: Saint-Lucia, 10 m, 5,1 x 3,5 mm.*

count about 10 white squares and many brown squares, giving a pattern different from that of the prominent rows. The background is greyish".

Complementary description: On the ground of the specimens from Curaçao sampled in 20-30 m and 30-60 m, considered as topotypes and showing the same outline than the figured holotype (DE JONG AND COOMANS, 1988: figs. 543 AandB), further details can be added.

The apex can be more or less flat and wide, excavated or bulging, but generally it is submerged by enamel callus. In some cases, the suture of the last whorl makes a sharp elevation around the flattened spire and the top of the shell forms like a wide and shallow crater. Rarely, the coiling of the first whorls is suggested or partially visible. The place of the protoconch can be suggested where a more or less pronounced pit occurs on the flattened apex (Fig. 10 A).

A thin varix-shaped fold borders the edge of the labrum, enlarging progressively towards the base, and making a distinct oblique callus at the base of the ventral side, after bypassing the deep siphonal notch. About 30 very small denticles are visible on the inner lip. The 4 anterior columellar plaits are strong and arched (the first one being the larger), and followed by about 5 columellar lirations. The left basal keel is generally shorter than the right one, rarely reaching the same level.

The ground decoration consists of golden to chestnut-orange oval ocelles on a creamy-beige background (better than greyish as reported for the holotype) and crossed by 2 prominent and 3 fainter spiral rows of large chestnut-orange squares or rectangles with dark borders and separated by white intervals. The ground decoration of ocelles is often disintegrated in irregular dashes or spots, like it is visible in the holotype.

Among the 18 adult shells considered as topotypes, all but one show a large dark brown patch covering most of the external columella, from the level of the second plait to the third posterior quarter of the aperture. The development of this patch occurs in the subadult stage. This specific character is not represented in the holotype.

The shell outline is oval subpyriform. Animal unknown.

Measurements: Holotype: 6.5 x 3.7 mm (ZMA). Topotypes: L=5.05 to 6.30 mm (FBC).

Distribution: The species is known from Curaçao, Saint-Vincent and Saint-Lucia, mostly from 20 to 40 m.

J. Colomb remarked however (pers. comm.) that the material from Saint-Lucia consists of few dead shells from one sampling at only 2 m deep, within an anchorage where an artificial dyke was strengthened by the supply of sands brought from another place. Due to the facts that he did not find the species in other places along the western coast of Saint-Lucia, and that other "southern antillean species" (like *Conus aurantius* Hwass, 1792) were also found in dead conditions in the surrounding of the same artificial dyke, J. Colomb suggested that the lot of *G. cordorae* from Saint-Lucia may have been transported here by human industry.

The gap in the geographic distribution between Curaçao and Saint-Vincent is probably due to the lack of adequate sampling efforts at appropriate depths in this area.

Remarks: The morphology of the shell and its decoration do not show any remarkable variation along the distribution range of the species.

The population from Saint-Vincent is very homogeneous and shows faint differences with the topotypes from Curaçao: the shells from Saint-Vincent present a smaller average size, a more rounded shell, the apex being never fully crater-excavated with a central pit (Fig. 10 C), nor really bulging. The left basal keel is always shorter than the right one. The ground colour is honey to beige, decorated of large oval ocelles at both tips, which tend to disintegrate in a flecked pattern at the median part of the shell. The dark ventral patch is always present in adult and subadult from Saint-Vincent, even in very worn state.

The shells found in Saint-Lucia do not show any difference with the shells

from Saint-Vincent, except for the pattern of oval ocelles which do not tend to disintegrate in the small lot at hand.

It must be underlined that several of the features discussed here are very subtile, and their comparative study requires homogeneous conditions of observation and preservation. For instance, when ventral views of the shells are not perfectly taken in the plan, and when the aperture is slightly turned towards the left whereas the base is slightly carried towards the backside (as in Fig. 9), so the labrum seems to be thicker, the top wider and the left keel longer than in reality.

The topotypes from Curaçao show a higher variability in morphology, proportions and decoration, but the small lot coming from shallow water (6-10 m, 4 ad + 3 juv) show the most divergent features. The four adult shells have a slender subcylindric outline, the top is narrow, the top of the outer lip shows a clear tendency to encompass the apex (Fig. 10 B), the basal keels tend to reach the same level, and only one of the 4 adult shells shows the ventral brown patch. Their ground bottom is greyish rather than creamy-beige, and the pattern of small ground ocelles is very ill defined.

Gibberula colombiana sp. nov. (Figs. 1-4, 10 D).

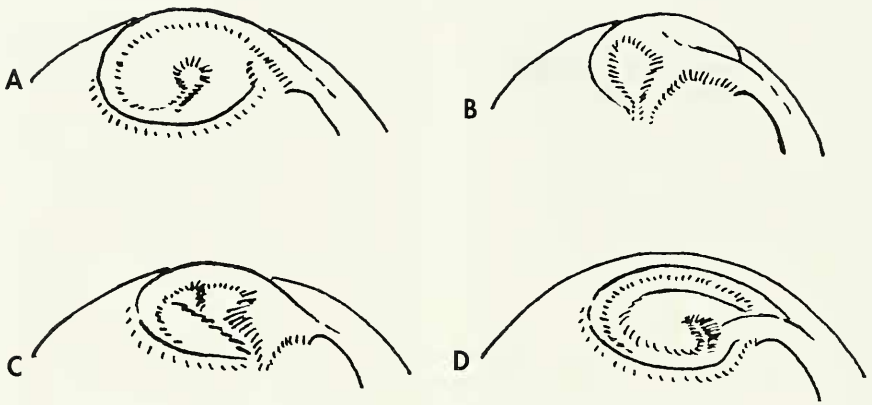
Type material: Holotype (Figs. 1, 2) in MNHN; 6 paratypes (Figs. 3, 4) (ad spm) in JCC; 4 paratypes (1 ad spm, 1 subad spm and 2 juv spm) in FBC; all from the type locality.
Other material studied: 6 ad sh (L=5 to 5.6 mm), Anse d'Arlet, Martinique, 30 m, F. Boyer and R. Delannoye splg 05-97, FBC; 1 ad sh (L=5.8 mm), 1 juv and 1 fragment, Cap Salomon, Martinique, 22-25 m, P. Clovel splg 28-06-97, FBC; 6 ad sh (L=5.4 to 6.2 mm), 6 juv, Cap Salomon, Martinique, 22-25 m, P. Clovel splg 12-08-97, FBC; 4 ad sh (L=4.9 to 5.7 mm), 5 juv, Cap Salomon, Martinique, 27 m, P. Clovel splg 29-08-97, FBC; 3 ad sh (L=5.4 to 5.9 mm), 1 juv, Cap Salomon, 30 m, P. Clovel splg 4-09-97, FBC; 1 ad spm (5.9 mm), 4 ad sh (L=5.15 to 5.40 mm), 43 juv, Cap Salomon, Martinique, 22-30 m, P. Clovel splg 6-09-97, FBC; 1 ad spm (L=5.6 mm), 4 juv, Anse d'Arlet, Martinique, 30 m, P. Clovel splg 10-98, FBC; 47 ad sh (L=5.42 to 6.27 mm), Grande Anse, Martinique, 20-25 m, J. Colomb splg 2001, JCC; 3 ad sh (L=5.35 to 5.70 mm),1 juv, Grande Anse, Martinique, 20-25 m, J. Colomb splg 2001, FBC; 1 ad sh, Guadeloupe, east coast, 15m, G. Paulmier splg and coll.
Type locality: Grande Anse, southwestern coast of Martinique, 20-25 m.
Etymology: From the name of Jacques Colomb (Marseilles, France), who first attracted the author's attention on the specificity of the population of *G.* cf. *cordorae* represented in Martinique.

Description: Shell medium-sized for the genus, outline oval subcylindric. The top is flat, wide and excavated, the suture of the last whorl making a sharp elevation around the spire, which partially reveals the coiling of the first whorls, slightly merged by enamel callus. The protoconch is suggested by a central pit.

The shoulder of the labrum is sharp and slightly elevated behind the top, the labrum is arched and thickened, and bears numerous tiny denticles almost obsolete on the upper part of the inner lip. A thin varix-shaped fold is bordering the edge of the labrum, enlarging progressively towards the base, encompassing the siphonal notch and making an oblique callus at the base of the columella. The 4 anterior columellar plaits are strong and arched, and followed by 5 columellar lirations. The left basal keel is much longer than the right one.

The ground decoration is made of orange-grey oval ocelles on a creamy-grey back, crossed by 2 prominent spiral rows of large honey-brown rectangles with dark borders and separated by white intervals. 3 fainter spiral rows of creamy-grey rectangles separated by white intervals are distributed on either sides of the 2 prominent spiral rows. Some of the ground ocelles are partially obsolete or divided in small spots and flecks. Any colour patch is not present on the columella.

Animal (from photos and drawings made by R Delannoye and J. Colomb): the wide foot is hyalinous covered of



Figures 10 A-C. *Gibberula cordorae* (De Jong and Coomans). A: Curaçao, 30-60 m; B: Curaçao, 6-10 m; C: Saint-Vincent, 40 m. Figure 10 D. *Gibberula colombiana* sp.nov., Martinique, 20-25 m. *Figuras 10 A-C.* Gibberula cordorae *(De Jong and Coomans). A: Curaçao, 30-60 m; B: Curaçao, 6-10 m; C: Saint-Vincent, 40 m. Figure 10 D.* Gibberula colombiana *sp.nov., Martinique, 20-25 m.*

milky white large lateral patches (sometimes creamy white or light yellowish towards the posterior part) and by many smaller irregular spots more densely grouped on the front of the propodium and on the back axis of the metapodium. Few orange dots are scattered on the hyalinous ground and more densely grouped on the back axis of the metapodium. The bifurcate head and the siphon are milky white, with some orange dots around the eyes. The long hyalinous tentacles are decorated by whitish dashes and dots, and by scattered orange dots. The eyes are black.

Measurements: Holotype: 6 x 3.8 mm (MNHN). Paratypes 1 to 6, L=5.86 to 6.23 mm (JCC). Paratype 7 (ad.sh), L=5.9 mm, paratypes 8 to 10 (subad and juv.sh), L=4.9 to 5.5 mm (FBC).

Distribution: The species is known from Martinique by many individuals and from Guadeloupe by only one shell. This last one is absolutely similar to the material from southwest Martinique, and the datum given by G. Paulmier is confirmed as right. So the species must be ranging at least from Martinique to Guadeloupe, the extension of the distribution towards northern Lesser Antilles remaining possible on the ground of new discoveries.

Remarks: *G. colombiana* sp. nov shows very homogeneous shell morphology and decoration, and presents close similarity with *G. cordorae*. Most of the features represented in *G. colombiana* belong to the range of variability represented in the populations of *G. cordorae* from Curaçao. The large size and the excavated top of the shell of *G. colombiana* (Fig. 10 D) match the features occurring in several topotypes of *G. cordorae* (Fig. 10 A). The subcylindric outline and the greyish ground of decoration found in *G. colombiana* match the features of the shells of *G. cordorae* studied from shallow water in Curaçao (6-10 m).

However, two special characters can be considered as distinctive features of *G. colombiana*: the longer left basal keel and the total lacking of a ventral brown patch. The first character is especially original, as such a produced keel is very uncommon within the genus. The second character is significant from a statistic point of view, as the ventral patch is represented as highly dominant in *G. cordorae*, lacking only in few shells from Curaçao and never lack in the shells from Saint-Vincent and Saint-Lucia. The presence of a ventral patch can be considered as a specific feature of *G. cordorae*, accidentally absent (or much

Figure 11. Map of the Eastern Caribbean Sea.
Figura 11. Mapa del Este del Mar Caribe.

obsolete) in some shells, whereas the total lack of ventral patch in *G. colombiana* can be interpreted as a proper specific feature.

On the other hand, it must be underlined that the very homogeneous shell features of *G. colombiana* show many similarities with some of the forms of *G. cordorae* ranging in Curaçao, but much less with the populations from Saint-Vincent and Saint-Lucia which range in a closer vicinity. In these conditions, the neighbouring populations from Martinique on one hand and from Saint-Vincent and Saint-Lucia on the other hand show as well-contrasted morphs, here interpreted as representing two allopatric sibling species.

DISCUSSION

On the ground of the phenotypic variability patterns observed within the populations of *G. cordorae* and of *G. colombiana*, the adjacent distribution of both species cannot be interpreted as resulting from a step by step settling leading to a continuous geographic cline, which is the most current situation within the non-planktotrophic groups such as cystiscids.

It seems more likely, in the present case, that the "*G. cordorae* group" has been subject to several periods of dispersion associated to geologic and hydroclimatic events along the perturbed history of the eastern antillean region (FAIRBRIDGE, 1966). According to this view, *G. cordorae* may represent a "southern stock" belonging to the Venezuelan area, and *G. colombiana* may represent an "eastern stock" coming from the old inner arc of the Limestone Caribbes.

The *G. cordorae* group has apparently not any other representant in the Caribbean Province, but a close relative is represented in the Panamic Province as *G. phrygia* (Sowerby, 1846), which presents a very constant pattern from Western Mexico to Galapagos Islands.

ACKNOWLEDGEMENTS

I am indebted to Regis Delannoye (Trinité, Martinique), to Pierre Clovel (Fort-de-France, Martinique) and to Jacques Colomb (Marseilles, France) for their active contribution to this study, for their sampling efforts and precious observations as well as for the gift or the loan of material. Gérard Paulmier (Monteaux, France) also loaned useful material.

A special thanks is due to Tiziano Cossignani (Ancona, Italy) who performed the photos and the digital plates, and to Rafael La Perna (Catania, Italy) for the helpful correction of the text.

BIBLIOGRAPHY

BOYER, F., NEEFS, J. AND WAKEFIELD, A., 1998. A new species of *Persicula* from the Venezuelan region (Gastropoda: Cystiscidae). *Journal of Conchology*, 36 (4): 15-20.

COOVERT, G. A. AND COOVERT, H. K., 1995. Revision of the Supraspecific Classification of Marginelliform Gastropods. *The Nautilus*, 109 (2-3): 43-110.

DE JONG, K. M. AND COOMANS, H. E., 1988. *Marine Gastropods from Curaçao, Aruba and Bonaire*. E. J. Brill, Leiden, 261 pp.

FAIRBRIDGE, R. W., 1966. *The Encyclopedia of Oceanography*. Reinhold Publishing Corp., New York, 779 pp.

SOWERBY, G. B., II, 1846. Monograph of the genus *Marginella*, in *Thesaurus Conchyliorum, or figures and descriptions of Recent Shells*, 1 (7): 239-406, pls. 68-78. Sowerby, London.